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The *Scirtothrips perseae* species-group (Thysanoptera), with one new species from avocado, *Persea americana*

LAURENCE A. MOUND[1] & MARK S. HODDLE[2]

[1]*Australian National Insect Collection CSIRO, PO Box 1700, Canberra, ACT 2601. E-mail: laurence.mound@csiro.au*
[2]*Department of Entomology, and Center for Invasive Species Research, University of California, Riverside, CA 92521, USA. E-mail: mark.hoddle@ucr.edu*

Abstract

Following recent molecular studies on avocado thrips, a new species is described from Costa Rica, Ecuador, and Colombia from the young leaves of avocado, *Persea americana*. *Scirtothrips hansoni* **sp.n.** is closely related to the Californian pest, *S. perseae*, and also to *S. astrictus* from Costa Rica that remains known from a single female. An illustrated key to these three species is provided.

Key words: Avocado, *Persea americana*, new species

Introduction

Leaves and young fruit of avocado trees (*Persea americana* [Laureaceae]) are damaged in California by an adventive species of Thripidae, *Scirtothrips perseae* Nakahara, a species with an extensive natural range that includes southern Mexico and Guatemala (Hoddle *et al*. 2002). Molecular studies on this and several other pest species in the genus *Scirtothrips* indicated that *perseae* has two particularly close relatives—an undescribed species from Honduras and a species identified as *astrictus* Mound and Marullo from Costa Rica (Rugman-Jones *et al*. 2007; Hoddle *et al*. 2008). However, *S. astrictus* was described from a single female collected in Costa Rica from leaves of a *Drimys* species [Winteraceae] (Mound & Marullo 1996), and this specimen has not previously been compared directly with the Costa Rican specimens from avocado used by Rugman-Jones *et al.* (2006, 2007) for molecular studies. Recent examination of the original female of *S. astrictus*, comparing it with the species that is common on avocado in Costa Rica, has led to the conclusion that the avocado-inhabiting thrips represents a previously undescribed species, and that this species has also been collected from immature avocado foliage in Ecuador and Colombia. The objective of this paper is to record the differences observed between samples of *Scirtothrips* taken from avocado at localities between California and Colombia, and to provide a securely based name for the common species on avocado in the more southern part of this range (i.e., Costa Rica, Ecuador, and Colombia).

The three species considered here are referred to as the *perseae* species-group, and they share the following character states: ocellar triangle with irregular reticulate sculpture and ocellar setae pair III arising within the triangle; fore wing cilia wavy; tergites III–V median setae small and usually closer together than their length, and lateral microtrichial fields with no more than three discal setae; sternal microtrichial fields restricted to lateral thirds; female tergite IX with no discal microtrichia; male tergite IX with paired drepanae.

Key to *Scirtothrips* of the *perseae* species-group

1. Ocellar setae pair III arising anterior to a line tangential between anterior margins of posterior ocelli (Fig. 1) . . . . . *perseae*
-. Ocellar setae pair III arising between posterior ocelli (Figs 2, 3) 2

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2. Antennal segments III–V extensively pale in basal half (Fig. 9); pronotal sculptured fovae with no pigmentation (Fig. 2); tergites pale with no brown anterolateral areas, antecostal ridge dark medially but pale close to tergal lateral margins . . . . *astrictus*

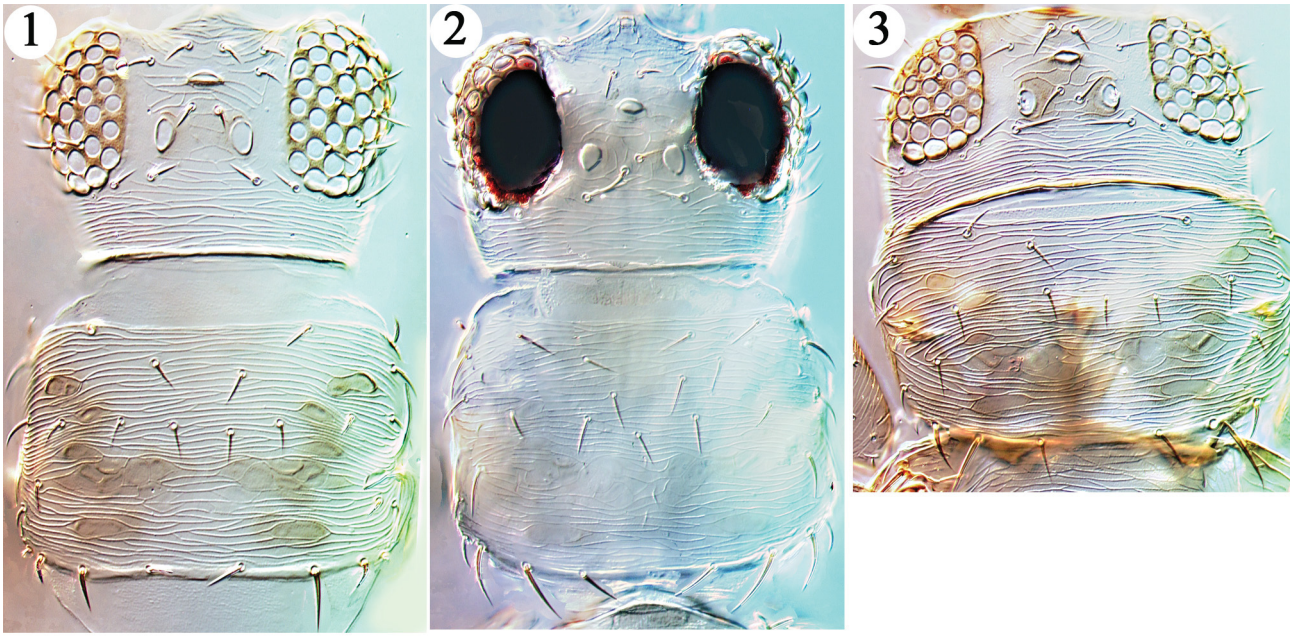
-. Antennal segments III–V mainly dark brown (Fig. 8); pronotal sculptured fovae extensively light brown (Fig. 3); tergites III–VI with conspicuous brown areas anterolaterally; antecostal ridge dark to lateral margin of tergites . . . . . *hansoni* **sp.n**.

Scirtothrips perseae **Nakahara, 1997**

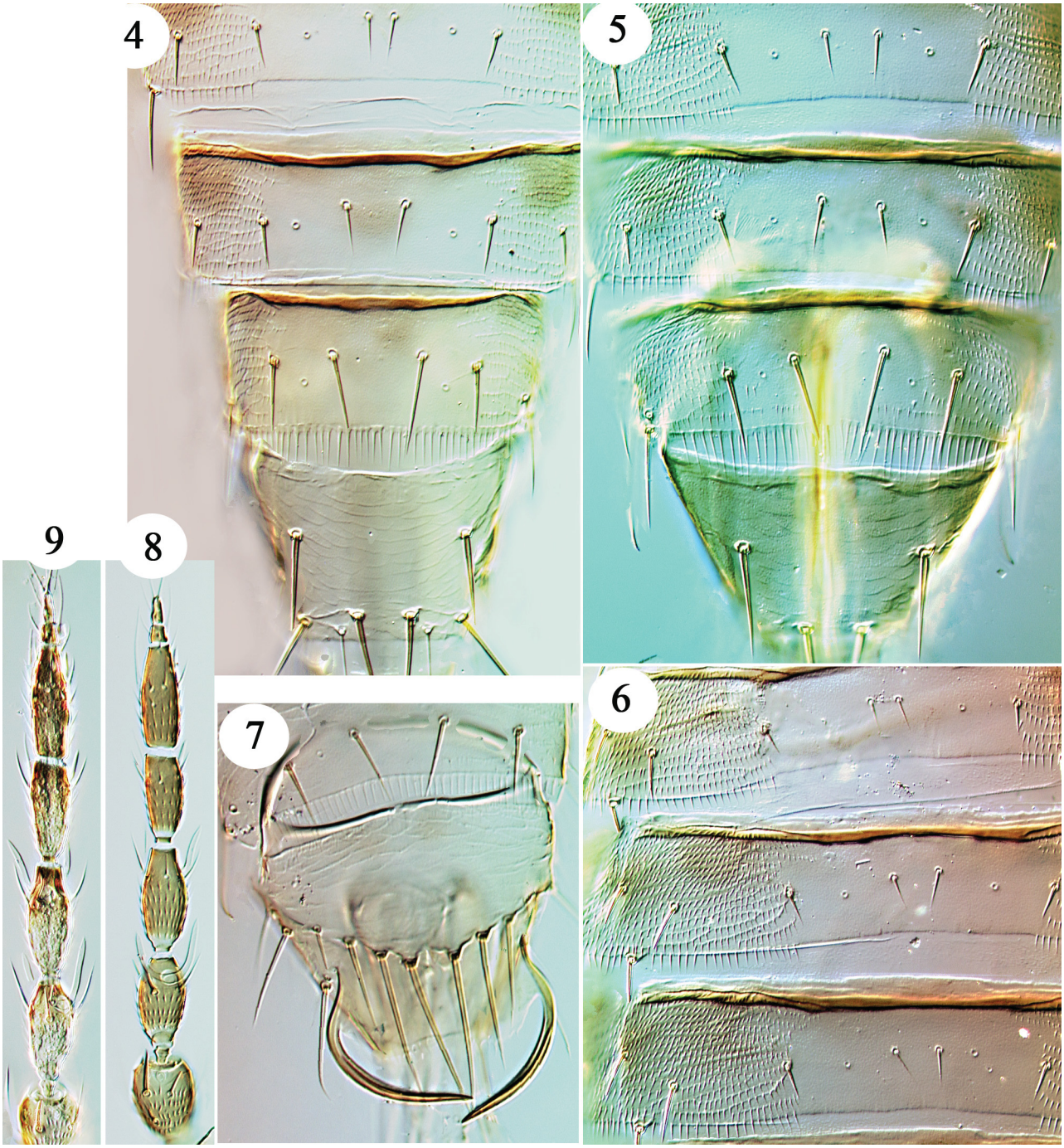
(Figs 1, 4)

Described from specimens of both sexes collected on immature avocado leaves and young fruit in southern California, the original description included comparisons with three species of *Scirtothrips*. Two of these are from North America, and both are clearly not closely related to *perseae*. The first, *S. aceri* Moulton is associated with the immature leaves of *Quercus* in California, and belongs to a group of species in which the two median tergal setae are small and wide apart. The second, *S. citri*, is the polyphagous California citrus thrips, and this has the following character states: abdomen yellow with at least four pairs of tergal discal setae on the lateral microtrichial fields; tergite IX with several rows of microtrichia; males without drepanae on tergite IX. In the original description, comparisons of *perseae* with the third species, *S. astrictus*, were based not on the single original female of that species, but on specimens collected subsequently in Costa Rica from avocado leaves. These specimens are described below as a new species, *hansoni* **sp.n**., as distinguished in the key above.

Molecular data has indicated that *perseae* was introduced into California from Mexico (Rugman-Jones *et al*. 2007), and that this species also occurs in Guatemala. In contrast, molecular data indicated that a population from Honduras was a closely related but undescribed species (Hoddle *et al*. 2008). This sample from Honduras has now been studied and no structural differences can be found between it and specimens from California. These Honduran specimens are therefore interpreted as representing the morphological species *perseae*, despite being distinguished at the molecular level from *S. perseae* from Mexico and Guatemala. This is thus another example of molecular divergence within a species of Thripidae that is unaccompanied by observable structural divergence. The most important previous example is the pest species, Western flower thrips, *Frankliniella occidentalis* (Pergande). This has been demonstrated to comprise two genetically distinct, but morphologically inseparable, species that coexist in California (Rugman-Jones *et al*. 2010). For field biologists there remains a concern that no biological or ecological differences have been demonstrated between pairs of these two molecularly separable "species" (i.e., *F. occidentalis* and *S. perseae*).



FIGURES 1–3. *Scirtothrips* species, head and pronotum. **(1)** *perseae*; **(2)** *astrictus* holotype; **(3)** *hansoni* holotype.



FIGURES 4–9. *Scirtothrips* species. Tergites VI–IX 4–5: **(4)** *perseae*; **(5)** *hansoni* holotype. **(6)** *hansoni* holotype tergites III–V. **(7)** *hansoni* male tergites VIII–IX. **(8)** *hansoni* holotype antenna. **(9)** *astrictus* holotype antenna.

***Scirtothrips astrictus* Mound & Marullo, 1996**
(Figs 2, 9)

This remains known from a single female taken from a species of *Drimys* [Winteraceae], in forest on Cerro de la Muerte in Costa Rica. At the time of description, it was considered the only *Scirtothrips* species native to Central America with ocellar setae pair III arising between the posterior ocelli, although this unusual character state occurs also in *S. oligochaetus* (Karny), an Asian species adventive to this area. When specimens with this character state were collected subsequently in Costa Rica from avocado the assumption was made that these represented *astrictus*, and that the pale colour of the holotype was due to it being teneral. However, recent re-examination of the holotype

indicates that this assumption was incorrect, because two fully-developed eggs are visible in the abdomen indicating that the female holotype was mature when collected. There are no dark areas on the tergites, and the tergal antecostal ridge is dark only to a point mid-way between tergal discal setae S2 and S3, not to the lateral margin of the tergite. Tergite VIII has a few discal microtrichia near the posterior margin between setal pair S1, and antennal segments III and IV are yellow in the basal half (Fig. 9). All of the morphological character states of this single female are found also in one or more populations of the species that is widespread on avocado between Costa Rica and Colombia. However, the colour differences are sufficiently distinctive to conclude that *astrictus* is a different species from the one common on avocado.

***Scirtothrips hansoni* sp.n.**
(Figs 3, 5–8)

Female macroptera. Body pale with extensive light brown markings; antennal segment I yellow, II–VIII brown (Fig. 8); head with ocellar triangle shaded (Fig. 3), postoccipital ridge dark; pronotum with broadly U-shaped light-brown band associated with the foveae; abdominal tergites with paired dark areas anterolaterally, antecostal ridge dark fully across tergites; tergite IX darker than X or median area of VIII; fore wing light brown on basal half, including clavus but paler toward apex; femora brownish yellow, tibiae and tarsi paler; major setae light brown.

Antennae 8-segmented, II with inner dorsal seta at least 1.5 times as long as outer seta, sense cones on III–IV forked and stout (Fig. 8). Ocellar triangle with irregularly reticulate striae (Fig. 3); ocellar setae III variably and sometimes asymmetrically placed, but arising between hind ocelli; postocular area transversely striate; postocular (po) setae I and II both as long as or longer than ocellar setae III, po setae III minute, po setae IV arising laterally and shorter than I and II; compound eyes each with 2 pairs of very weakly pigmented facets. Pronotum striate, striae about 5 microns apart with 4–6 discal setae in median irregular transverse row (Fig. 3); 4 pairs of posteromarginal setae, pair S2 almost twice as long as S1. Metanotum with transverse striae near anterior margin but irregular longitudinal reticulations posteriorly; median setae arise near but behind anterior margin. Fore wing first vein with about 7 setae on basal half and about 4 setae on distal half, second vein with 2–4 setae; clavus with 4 marginal setae and one discal seta; marginal cilia wavy. Abdominal tergites II–VI with median setae short but variable in length both between tergites and between individuals, with bases rarely further apart than the setal length (Fig. 6); lateral microtrichial fields each with 3 discal setae; VIII with a medially interrupted single row of discal microtrichia extending mesad close to posterior margin (Fig. 5), but this row is absent in specimens from Ecuador and Colombia; IX with no discal microtrichia, X without microtrichia, without median division. Sternites with lateral microtrichial fields small, rarely with a few microtrichia extending mesad of marginal setae S2.

Measurements (holotype in microns). Body length 960. Head, length 75; width 155 (slightly depressed); ocellar setae III 15; postocular setae I 20. Pronotum, length 95, width 180; posteromarginal setae S1 20, S2 37. Metanotum median setae 19. Fore wing length 760. Median setae on tergite IV 10 and 15. Antennal segments III–VIII length 42, 42, 35, 42, 7, 12.

Male macroptera. Similar in colour and sculpture to female but smaller; tergite IX with long, curved drepanae (Fig. 7).

Material studied. Holotype female: **COSTA RICA**, Monte Lindo del Patio de Agua, from avocado leaves, 17.iii.2004 (M. Hoddle) (in Entomology Research Museum, University of California, Riverside, Accession Number UCRC_ENT 00426886).

Paratypes: with same data as holotype, 4 females, 5 males; **PANAMA**, Cerro Punta, 3 females, 1 male from avocado, 23.iii.2004 (Mark Hoddle); **ECUADOR**, Nanegalito, [50km northwest of Quito], 10 females from avocado, 29.ix.2009 (Mark Hoddle); **COLOMBIA**, Medellin area, 36 females, 2 males, from avocado leaves, xii.2014 and i.2015 (R. Isaza).

Comments

This new species appears to be identical in chaetotaxy and sculpture to *S. astrictus*, but differs clearly in colour. Most character states are shared also with *S. perseae*, but it differs from that species in the more posterior position

of ocellar setae pair III, and the metanotal median setae arise slightly further from the anterior margin of this sclerite. However, there is variation within and between the available samples of *hansoni* in both of these character states. This variation is evident in the asymmetric positions of the ocellar setae of the holotype (Fig. 3). In this specimen, the left seta arises near the anterior extreme and the right seta near the posterior extreme which represents the range of variation among other specimens of this species. Similarly, the bases of the metanotal median setae are between two and four times the diameter of their basal pores from the anterior margin of this sclerite, and are commonly asymmetric in position. The available data indicate that *hansoni* is found on *Persea* species southwards from Costa Rica, whereas *perseae* has a more northerly distribution in Meso-America.

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